Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Expanding Flexible Use of the 3.7 to 4.2 GHz Band	)	GN Docket No. 18-122
	)	

COMMENTS OF ERICSSON

Ericsson submits these comments for the public record to the above-referenced open proceeding.

I. INTRODUCTION

As the Commission is clearly aware, mid-band spectrum is a crucial component to 5G since it provides a good balance of effective propagation and increased capacity—simply put, mid-spectrum will allow for larger amounts of data to travel farther. The C-Band (3.7-4.2 GHz) presents a prime opportunity to making a sizable portion of this critical spectrum available in relatively short order.

Recent comments from the C-Band Alliance (CBA) on the prospect of freeing up more than 200 MHz of spectrum are promising but Ericsson believes the goal of the Commission should be at least 300 MHz. Several Commissioners also support this aspiration[1], and for good reason, as several other countries are surpassing the U.S. in making more licensed mid-band spectrum available to its carriers—some plan to provide more than 300 MHz of this vital spectrum by the end of next year[2]. For the U.S. to maintain its leadership in 5G deployments and

[1] "Carr Backs Repurposing at Least 300 MHz of 3.7-4.2 GHz Band", TR Daily, October 9, 2019
[2] David Abecassis, Janette Stewart, Michael Kende, Chris Nickerson, 5G MID-BAND SPECTRUM GLOBAL UPDATE (Analysys Mason, November 2018)

spur the next iteration of wireless innovation for consumers and businesses, it must match the efforts of these other countries.

Ericsson believes that current market conditions and changing consumer habits warrant repurposing at least 300 MHz of this essential spectrum. Doing so will ensure the U.S. remains competitive and maintains its innovative leadership by having the most advanced 5G networks in the world.

II. ERICSSON BELIEVES THAT REPURPOSING AT LEAST 300 MHZ IS REALISTIC AND IN THE PUBLIC INTEREST

Ericsson is confident that through existing technologies it is possible to free up at least 300 MHz of spectrum in the C-Band for wide area commercial mobile service and such repurposing would be in the public interest.

In order to meet the growing demand for mobile broadband, the wireless industry has continually employed newer technologies (such as higher orders of QAM, multi-user MIMO) and practices (densification, beamforming, 4G-5G dynamic spectrum sharing) to improve spectral efficiency—5G provides substantial spectral efficiency gains over 4G. As stewards of this vital yet finite resource, all spectrum licensees should strive to utilize the spectrum as efficiently as possible and use only what is needed.

An August 2019 study by North Sky Research estimated that most video programming channels still transmit on older technologies such as DVB-S and MPEG-2. Whereas if they were to employ more current standards/technologies such as DVB-S2X and HEVC (H.265), they could significantly reduce their bandwidth requirements by up to 50 percent[3].

[3] "HEVC (H.265) Vs. AVC (H.264) - What's The Difference?" https://www.boxcast.com/blog/hevc-h.265-vs.-h.264-avc-whats-the-difference (September 20, 2018)

Given that one of the key responsibilities of the FCC, prescribed by Congress, is to encourage "more effective use of radio in the public interest," Ericsson would urge the Commission to consider providing greater incentives to ensure licensees are employing more spectrally efficient technologies, standards, and practices.

Ericsson also believes that repurposing at least 300 MHz is in the public interest. There are numerous reports and statistics that show the increasing growth and significant benefits from mobile broadband. U.S. mobile data traffic per active smartphone user is forecasted to grow from 8.6 GB in 2018 to 50 GB in 2024[4]. Accenture has also predicted the deployment of 5G will create three million new jobs and add $500 billion to the economy.

Where the wireless industry has seen this tremendous growth, C-band satellite services have generally been in decline[5]. In fact, several of the CBA members have seen decreases in revenue[6,7]. It is very clear that the public interest would benefit more from repurposing at least 300 MHz of C-Band spectrum for mobile broadband.

III. ERICSSON SUPPORTS IMPLEMENTATION OF A HIGHER EARTH STATION ELEVATION ANGLE

To ensure that mobile 5G users can completely benefit from the repurposed C-Band spectrum it is important to minimize encumbrances in the band. For instance, Ericsson agrees with other commenters[8,9] that a 5° earth station elevation angle is overly conservative and instead

[4] Ericsson Mobility Report November 2018
[5] Lluc Palerm-Serra, "REPURPOSING SPECTRUM FOR 5G: WHERE IS THE BALANCE?" https://www.nsr.com/repurposing-spectrum-for-5g-where-is-the-balance/, September 3, 2019
[6] Stuart Thomson, "SES hit by declining video business" https://www.digitaltveurope.com/2019/07/30/ses-hit-by-declining-video-business/ (July 30, 2019)
[7] Annamarie Nyirady, "Intelsat Satellite Failure Cuts into Q2 Revenues" https://www.satellitetoday.com/business/2019/07/30/intelsat-satellite-failure-leads-to-sharp-q2-losses/ (July 30, 2019)
[8] *See* T-Mobile Written Ex Parte Communication, GN Docket No. 18-122, Expanding Flexible Use of the 3.7 GHz to 4.2 GHz Band, at 8 (October 2, 2019)
[9] See Verizon Comments Expanding Flexible Use of the 3.7 to 4.2 GHz Band, GN Docket No. 18-122 at 7 (August 14, 2019)

suggests setting a minimum elevation angle of 20°, which could provide a 15 dB relaxation of the isolation requirement that would allow for substantial reduction in coordination requirement between 5G base stations and earth stations. As shown in the following table, and as Ericsson has demonstrated in previous studies[10], changes to the elevation angle plays a significant role in co-existence.

Changing Elevation Angle		
From	***To***	***Isolation Relaxation***
5°	5°	0
5°	10°	7.5 dB
5°	20°	15 dB
5°	30°	19.4 dB
5°	40°	22.6 dB

Reducing coordination requirements can be a significant impediment to the deployment of 5G[11]. It is our recommendation that by reducing the span of satellite, such that the longitude and latitude between the satellites and the earth stations they serve are narrowed, emission requirements can be reduced between the base station and earth stations.

As shown on the following table[12], the assumption of full-arc is highly conservative as it is applicable primarily for extreme scenarios such as an earth station in Maine being served by a geostationary satellite over the pacific (e.g., 139W) or an earth station in Alaska with a geostationary satellite over 89W.

[10] See Ericsson Reply Comments GN Docket No. 18-122, Expanding Flexible Use of the 3.7 GHz to 4.2 GHz Band, at 2 (December 11, 2018)
[11] See AT&T Letter, Expanding Flexible Use of the 3.7 to 4.2 GHz Band, GN Docket No. 18-122, at 4 (May 23, 2019)
[12] Source for table: https://www.groundcontrol.com/Satellite_Look_Angle_Calculator.htm

Satellite	Longitude	Location	City	Zip Code	ES Elevation Angle
SES 2	87W	MI, WI, TN, FL	Anchorage	99501	4
			Seattle	98101	25.5
			Los Angeles	90001	38.3
AMC 8	139W	W Alaska	Maine	04043	5.9
			New York	10001	10.1
			Miami	33140	19.7
Galaxy 15	133W	Alaska Panhandle	Maine	04043	11.1
			New York	10001	14.5
			Miami	33140	25
AMC 11	131W	Alaska Panhandle	Maine	04043	12
			New York	10001	16
			Miami	33140	26.9

When earth station elevation angles can be raised to 20° or more, the isolation requirement can be relaxed by as much as 15 dB. In fact, many states, especially in the southern part of the country (e.g. California, Texas, and Florida) can even implement earth stations elevation angles higher than 30°, thereby further relaxing the isolation requirement to over 19.4 dB. With some planning and the use of alternatives to full-band, full-arc, more appropriate earth station protection zones could be achieved. This would be simplifying coordination between 5G deployments and the earth stations. It would also simplify 5G filter designs for base stations and thereby reducing costs and improving operations.

Ericsson commends the CBA's proposal of launching additional satellites in addition to moving or re-orienting existing satellites to new orbital position. Ericsson believes that this is an opportunity to raise the Earth Station elevation angles to between 20° and 40° across the continental US, thereby reducing the isolation requirements between 5G base stations and earth stations by 15 to 20 dB.

Ericsson further submits that areas that require tighter coordination between base stations and earth stations are typically locations with close proximity between them. Such areas are

typically downtowns or dense urban areas. As pointed out by Nokia in their simulation[13], which concurs with Ericsson's study, earth station antennas are usually mounted on rooftops, which are usually higher than base station heights. Any base stations that are deployed on rooftops normally employ down-tilt antennas. As per Ericsson study[14] for a base station inter-site distances (ISD) of 200m and 100m separation distance a base station and earth station and an earth station elevation angle of 20°, when going from an earth station height of 10m to 100m, the emission requirements can be reduced by 22 dB. Alternatively, with a 45° elevation angle, the emission requirements can be reduced by 17 dB.

IV. CONCLUSION

Ericsson urges the Commission to facilitate repurposing as much of the C-band as possible but at least 300 MHz of C-Band spectrum for wide area coverage purposes. Ericsson further asks the FCC to ensure that appropriate parameters are in place to allow co-existence. Doing so will allow the U.S. to expand its innovative leadership and ensure that the mobile economy continues to thrive and provide greater economic prosperity and security.

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October 23, 2019

[13] See Comments from Nokia on GN Docket No. 18-122, Expanding Flexible Use of the 3.7 GHz to 4.2 GHz Band, (October 29, 2018)
[14] See Ericsson Reply Comments GN Docket No. 18-122, Expanding Flexible Use of the 3.7 GHz to 4.2 GHz Band, at 2 (December 11, 2018)